^{100}Nb IT decay (12.4 µs)   1999Ge01,1986LhZX,2013RuZX

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 172, 1 (2021)	31-Jan-2021

Parent: ^{100}Nb: E=734 *23*; J$^{\pi}$=(8^{-}); T$_{1/2}$=12.4 µs *3*; %IT decay=100.0

1999Ge01: measured γ, ce, γ(ce), T$_{1/2}$ using Ge and Si detectors, time correlation between fission fragments and γ rays or conversion electrons. The ^{100}Nb isomer produced in thermal neutron fission of ^{241}Pu followed by mass/charge separation at with Lohengrin spectrometer at ILL.

1986LhZX: measured prompt and delayed γ rays from fission.

2013RuZX: measured half-lives of levels by γ(t) and $\gamma\gamma$(t) using Lohengrin mass separator at ILL-Grenoble.

1980MoZJ: measured half-life of the isomer and γ intensities.

Other: 1970Gr38.

Additional information 1.

^{100}Nb Levels

E(level)[†]	J$^{\pi}$[#]	T$_{1/2}$	Comments
314 *23*	(5)$^{+}$	2.99 s *11*	Additional information 2. E(level),J$^{\pi}$: lowest level in 1999Ge01 likely corresponds to the 2.99-s, (5^{+}) isomer of ^{100}Nb, reported by 2007Ri01 and 2007Ha32 at 314 *23*. 2017Au03 give 313 keV *8*. Evaluators could not find rationale for low uncertainty in 2017Au03. T$_{1/2}$: from the Adopted Levels.
348 *23*	(4^{-},5^{-},6^{-})	0.41 µs *6*	T$_{1/2}$: weighted average of 0.4 µs *1* (2013RuZX,$\gamma\gamma$(t)); 0.46 µs *6* (1986LhZX,$\gamma\gamma$(t)); 0.32 µs *8* (1970Gr38, x-ray(t)).
415.7?[‡]			E(level): level from 1986LhZX and 1980MoZJ, not reported by 1999Ge01.
521 *23*	(5^{-},6^{-},7^{-})	207 ps *14*	T$_{1/2}$: from $\gamma\gamma$(t) (2013RuZX). Other: <1 ns (1986LhZX).
706 *23*	(6^{-})		T$_{1/2}$: <10 ns assumed by 2013RuZX.
734 *23*	(8^{-})	12.4 µs *3*	J$^{\pi}$: possible πg$_{9/2}\nu$h$_{11/2}$ configuration from systematics of N=57 and 59 isotones (1999Ge01). But theoretical calculations (2000Lh01) predict 8^{+} with πg$_{9/2}\nu$g$_{7/2}$ configuration. T$_{1/2}$: from 2013RuZX (γ(t) for 173-, 185- and 359-keV γ rays; also reported 11 µs *2* from γ(t) for 185γ, using a different analysis). Others: 13 µs *1* from 173γ(t)+185γ(t) in 1999Ge01, uncertainty of 5 µs in Fig. 3 seems a misprint; 12 µs (1980MoZJ).

[†] From a least-squares fit to γ-ray energies, assuming ΔEγ=0.5 keV for Eγ quoted to nearest tenth of keV and 1 keV for other case, unless otherwise noted.

[‡] Level reported by 1986LhZX and 1980MoZJ only, not confirmed in 1999Ge01 and 2013RuZX. It is treated as questionable (by evaluators) and is not listed in the Adopted Gammas.

[#] From the Adopted Levels.

γ(^{100}Nb)

Iγ normalization: Σ(I(γ+ce) of γ rays from 707 level)=100.

Eγ[†]	Iγ[†&]	E$_i$(level)	J$_i^{\pi}$	E$_f$	J$_f^{\pi}$	Mult.[@]	α[a]	Comments
28	2.3 *CA*	734	(8^{-})	706	(6^{-})	(E2)	110.5	Iγ: deduced from Σ(I(γ+ce) of γ rays from 707)=252 and α(28γ)=110.5. Mult.: α(K)exp=57 *18* (1986LhZX). Also ce data (L-conversion line) from 1999Ge01.
34.3	53 *CA*	348	(4^{-},5^{-},6^{-})	314	(5)$^{+}$	(E1)	2.55	Iγ: deduced from I(γ+ce)(173.3γ)+Iγ(358.6γ)=189 and α(34γ)=2.55. Other: $\approx$640 (1980MoZJ). Mult.: proposed by 1999Ge01 from ce spectrum and also

Continued on next page (footnotes at end of table)

<u>^{100}**Nb IT decay (12.4 μs)**   **1999Ge01,1986LhZX,2013RuZX (continued)**</u>

<u>γ(^{100}Nb) (continued)</u>

$E_\gamma{}^\dagger$	$I_\gamma{}^{\dagger\&}$	E_i(level)	J_i^π	E_f	J_f^π	Mult.$^@$	α^a	Comments
								based on the 28γ(E2)−185γ(M1)−173γ(M1) cascade from 735,(8$^-$) level. But M1 from α(K)exp=4.7 *5* in 1986LhZX.
67.1$^{\ddagger b}$	6$^{\#}$	415.7?		348	(4$^-$,5$^-$,6$^-$)			
101.9$^{\ddagger b}$	6$^{\#}$	415.7?		314	(5)$^+$			
106.6$^{\ddagger b}$	3$^{\#}$	521	(5$^-$,6$^-$,7$^-$)	415.7?				
173.3 *2*	96	521	(5$^-$,6$^-$,7$^-$)	348	(4$^-$,5$^-$,6$^-$)	M1	0.0505	α(K)exp=0.056 *15* (1999Ge01)
185.4 *2*	100	706	(6$^-$)	521	(5$^-$,6$^-$,7$^-$)	M1	0.0422	α(K)exp=0.036 *10* (1999Ge01)
358.6 *2*	88	706	(6$^-$)	348	(4$^-$,5$^-$,6$^-$)			
392.3 *2*	60	706	(6$^-$)	314	(5)$^+$			

† From 1999Ge01, unless otherwise stated.

‡ γ reported by 1986LhZX and 1980MoZJ only, not confirmed in 1999Ge01 and 2013RuZX. It is treated as questionable (by evaluators) and is not listed in the Adopted dataset.

$^\#$ From 1980MoZJ.

$^@$ From α(K)exp values of 1999Ge01, unless otherwise noted.

$^\&$ For absolute intensity per 100 decays, multiply by ≈0.40.

^{a} Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

^{b} Placement of transition in the level scheme is uncertain.

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Decay Scheme

Intensities: I$_{(\gamma+ce)}$ per 100 parent decays
%IT=100.0

Legend

$\longrightarrow$ I$_\gamma$ < 2%×I$_\gamma^{max}$
$\longrightarrow$ I$_\gamma$ < 10%×I$_\gamma^{max}$
$\longrightarrow$ I$_\gamma$ > 10%×I$_\gamma^{max}$
$\dashrightarrow$ γ Decay (Uncertain)

(8⁻)   28 (E2) 104   392.3 ≈25   358.6 ≈36   185.4 M1 ≈43   734   12.4 μs 3
(6⁻)   706

173.3 M1 ≈41   106.6 ≈1.2

(5⁻,6⁻,7⁻)   521   207 ps 14

101.9 ≈2.4   67.1 ≈2.4   34.3 (E1) 75.3

415.7

(4⁻,5⁻,6⁻)   348   0.41 μs 6
(5)⁺   314   2.99 s 11

$^{100}_{41}$Nb$_{59}$